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Professor Sperling

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This research effort developed a computational theory for the control of human attention in two-dimensional visual tasks. Theory and experiments focused on the role of the spatial modulation transfer function for human vision, and on the characteristics and limitations of cortical receptive field processes.

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Final Report for:
Prof. George Sperling
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University of California, Irvine

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This research effort developed a computational theory for the control of human attention in two-dimensional visual tasks. Theory and experiments focused on the role of the spatial modulation transfer function for human vision, and on the characteristics and limitations of cortical receptive field processes. As background, three distinct neural systems are considered. These systems, relevant to motion detection, object recognition, and selective attention have been determined in previous AFOSR-supported research. The first two systems operate monocularly. The third system operates with binocular vision and constructs depth perception from stimulus motion. The current project represents the attentional system as a linear space-invariant mechanism that implements a kind of spatial-frequency gain control over the visual field. The system that controls the spatial distribution of this gain can be approximated by a low-pass filter. The experimental portion of this research estimated and tested properties of this filter. These results enable a transfer function to be identified, giving the amplitude of the modulation of attention across visual space. There are many scientific and practical applications of this formulation, which has been presented in several peer-reviewed scientific journals. One example application is that, given any task-dependent visual requirements, the transfer function should suffice to compute the best possible spatial control of attention for the task.